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# Clinicians' Use Of mHealth Applications In Interventions For Substance Use Disorders

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# CLINICIANS' USE OF mHEALTH APPLICATIONS IN INTERVENTIONS FOR SUBSTANCE USE DISORDERS

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CONTENTS

LIST OF TABLES

CLINICIANS' USE OF mHEALTH APPLICATIONS IN INTERVENTIONS FOR SUBSTANCE USE DISORDERS

James Daniel Bender August 2021 57 Pages

Directed by: Qin Zhao, Karen Garrity, Frederick Grieve, and Sally Kuhlenschmidt

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The purpose of the study was to examine how clinicians are identifying, evaluating, and utilizing mHealth apps as treatment adjuncts with their clients who have a substance use disorder. A sample of 93 participants (20 males, 72 females, and 1 not listed) completed measures of demographics and inquiries about their use and evaluation of mHealth apps in their practices. Clinicians who work at mental health centers and private practicing clinicians were recruited. The majority of the sample (71%) reported that they had not utilized mHealth apps with their clients who have a substance use disorder diagnosis. Participants who have attended trainings regarding mHealth apps and participants who have had client inquiries about mHealth apps were more likely to recommend them to their clients. On average, clinicians who utilized mHealth apps only slightly to moderately educated clients regarding benefits, drawbacks, and protective measures of using mHealth apps. Age was a significant positive predictor for participants educating their clients about the benefits and drawbacks of using mHealth apps, whereas years of practice was a negative predictor for clinicians educating their clients about the benefits and drawbacks of using mHealth apps. Participants primarily recommended mHealth apps designed to help users lower stress and assist with restful sleep. Evaluation of mHealth apps was primarily completed by participants exploring the features of the apps themselves.

# Chapter 1: Introduction

## Substance Abuse Disorders and Treatment

Substance abuse or dependence continues to be a frequently reported occurrence in mental health settings (Zhang & Ho, 2016). These reports continue to increase and are made by a diverse population, affecting a wide variety of cultures and age groups. This is a pertinent problem, as substance abuse disorders (SUDs) cause individuals to become more vulnerable to developing other mental health disorders, leading to new obstacles and challenges in their lives (Zhang & Ho, 2016). Substance use also contributes to morbidity and mortality among youth and young adults, with significant consequences including criminality, sexually transmitted diseases, academic failure, and violence (Kazemi et al., 2017). The prevalence rate of substance abuse among young adults was 22%, as reported in a 2014 national survey of drug use and health (Kazemi et al., 2017).

Even though reports of substance abuse continue to increase, most individuals with substance abuse disorders as a primary diagnosis do not seek help (Zhang & Ho, 2016). In comparison to other mental health disorders, SUDs have the lowest treatment rates, despite having the highest burden in terms of morbidity and mortality (Zhang & Ho, 2016). Common components of effective treatment include support, structure, and goal direction (Kazemi et al., 2017). Effective treatment appears to be characterized by counselor-client cohesion and support, moderate structure, and goal-directedness oriented toward achieving clients' personal milestones and objectives. McKowen et al. (2017) discussed evidence that the individuals who seek treatment for substance abuse have high rates of attrition from treatment. This could lead to learned helplessness and loss of motivation for individuals who are attempting to maintain their recovery but struggling

with relapse (Wang et al., 2017). With relapse continuing to be a common obstacle for individuals with SUDs, clinicians and researchers search for new strategies and techniques to aid in treatment.

**mHealth Applications**

Mobile health care (mHealth) denotes the use of mobile devices within a health care context (Lui et al., 2017). mHealth is a rapidly growing area that relies heavily on mobile applications (apps) deployed to cell phones and handheld devices (Price et al., 2013). mHealth apps are being constructed to play central roles in evidence-based therapies (Price et al., 2013). There are currently a variety of mHealth apps available to assist individuals with various mental health symptoms and disorders, with a number of them aimed to assist individuals with SUDs (Lui et al., 2017).

Some mHealth apps such as Headspace can be used independently, without the assistance of a mental health professional; whereas others such as Pear reSET-O are designed to be used in conjunction with therapy (Prentice & Dobson, 2014). The majority of mHealth apps are self-guided, requiring no support and are most used for self-help purposes (Schueller &Torous, 2020). Guided or supported mHealth apps are used to increase engagement and effectiveness of the digital treatment, or to use components of the mHealth apps to supplement traditional care. mHealth apps for interventions have been used to help assess clients' symptoms as well as to deliver direct treatment to clients. They are able to track a variety of behaviors, thoughts, and symptoms, which could assist treatment interventions (Prentice & Dobson, 2014). Along with monitoring and tracking behaviors, mHealth apps include motivational and educational materials and support tools to assist individuals (Kazemi et al., 2017).

mHealth apps have been recently booming, partly due to health care costs and the limitations of available one-on-one therapy interventions (Berry & Lai, 2014). mHealth apps are low cost, portable, programmable, able to record information, easy to use, acceptable to both youth and parents, and have a near constant connectivity. mHealth apps are useful in providing psychoeducation, identifying resources, and allowing clients to self-monitor, and may open up avenues for two-way communication between therapists and clients (Berry & Lai, 2014).

Smartphone tools are now found in almost every facet of conventional medicine (Luxton et al., 2011). In the U.S., 91% of adults use a mobile phone, with over 50% owning smartphones (Kazemi et al., 2017). Berry and Lai (2014) noted that youth have access to mobile phones, with 78% of adolescents owning a cellular phone. Rates of smartphone use are also high within ethnic minority and low-income populations, allowing interventions to reach traditionally underserved populations (Lui et al., 2017).

There are currently 165,000 mHealth apps (free and paid) that are publicly available (Stoyanov et al., 2016). Over 10,000 of those apps are mHealth apps targeting mental health, and many patients are exploring them (Torous et al., 2018). In 2012, 19% of individuals who owned a smartphone had at least one app designed to promote health behavior or health maintenance (Stoyanov et al., 2016). There is currently a growing patient, clinical, government, and payer interest in the potential of mHealth technologies for clinical care (Torous et al., 2016). Patients are continuing to bring apps into clinical visits with hopes that clinicians can help them make an informed decision on whether the app is appropriate for their issues (Torous et al.).

Whether mHealth leads to better overall health outcomes and reduced disease burden is still unknown and there has been limited empirical research on mHealth apps (Kazemi et al., 2017; Kumar et al., 2013). Since mental health and behavioral disorders are the largest group of mHealth apps for a specific disease state, it is important for clinicians to weigh the pros and cons of using them and know how to evaluate them prior to recommending them to clients (Torous et al., 2016).

## Benefits of mHealth Applications

### *Increased Self-Monitoring*

A key feature of treating mental health disorders is for patients to monitor their own mental health (Proudfoot et al., 2010). Self-monitoring has been shown to improve patients' moods and behaviors and enhances their compliance with treatments. Self-monitoring is especially important for individuals struggling with SUDs. It is important for an individual to identify personal characteristics and experiences that are presumed to have triggered the onset of a relapse (McKay et al., 2006). This allows the individual to reflect on his or her relapse in order to gain insight to better assist his or her recovery in the future. It is beneficial for an individual to reflect on the relapse quickly, as there is a decay in the accuracy of memories over time. Daily diaries have been found to be useful for individuals to gather data on substance use, mood, cognitions, behaviors, and experiences. Keeping a daily diary assists individuals in identifying critical patterns (McKay et al., 2006). However, noncompliance is common during treatment of mental health disorders. One study found that, when using paper and pencil self-monitoring, actual patient compliance was 11% compared to a patient-reported compliance of 90% (McKay et al., 2006).

Mobile phones offer an alternative to paper and pencil self-monitoring (McKay et al., 2006). Using mobile phones, users can be prompted to respond, and these prompts can be scheduled for key times. For self-monitoring to be effective, it should take place regularly and in real time to reduce recall bias and increase accuracy (Proudfoot et al., 2010). mHealth apps give individuals the freedom to self-manage their own conditions (Zhang & Ho, 2016). They can assist individuals with self-reporting symptoms and can assist clinicians with understanding how their clients are progressing (Zhang & Ho). Luxton et al. (2011) also noted that, with the use of mHealth apps, clients' symptoms can be easily tracked over a long period of time and can be presented in a useful visual display to show treatment outcomes.

A pilot study was conducted that focused on assessing early-stage effectiveness and usability of a smartphone-based intervention system that provides a stand-alone, self-administered intervention option (Dulin et al., 2014). The intervention provided numerous features for intervening with ongoing drinking, cravings, connection with supportive others, managing life problems, high-risk location altering, and activity scheduling. In the study, 28 participants ranging from ages 22 to 45 used the app for six weeks. Participants stated that the app was useful in highlighting alcohol use patterns. They noted that tools such as managing alcohol craving, self-monitoring consumption, and identifying triggers to drink were particularly helpful. Drinks per day diminished by 52% by week six of the study (Dulin et al., 2014).

### *Increased Homework Compliance*

mHealth apps have the potential to increase homework compliance when used as an adjunct to traditional therapy (Lui et al., 2017). Homework adherence closely

correlates with overall treatment response, but adherence can be challenging (Price et al., 2013). Completing homework activities via a mobile app offers multiple methods to promote adherence and the collection of real-time data through a prompt for assessment may provide helpful feedback (Price et al., 2013). Aguilera and Muñoz (2011) used text-messaging to assist with increasing homework adherence, improving self-awareness, and helping track patient progress. Text-messages consisting of themes of a cognitive behavioral therapy intervention were sent out to participants. These themes included thought tracking, tracking of pleasant activities, tracking of positive and negative contacts, and tracking of physical well-being. Participants responded at a rate of 65% to text messages and reported an overall positive experience (Aguilera & Muñoz, 2011). Zhang and Ho (2016) noted that text messaging helps individuals maintain their sobriety and individuals have a better prognosis when these interventions are implemented early. There is increased user autonomy when clients track their symptoms and consistently complete homework, which helps shift treatment responsibility from clinician to clients (Prentice & Dobson, 2014).

***Increased Transfer of Skills***

The majority of individuals who seek treatment for substance abuse do not maintain continuous abstinence. A study that conducted a multi-site comparison of three outpatient treatments for alcoholism found that 40% of the participants reported both heavy drinking and recurrent problems within six months after treatment, and another 19% reported either heavy drinking or recurrent problems at that point (McKay et al., 2006). Other studies that conducted follow-up research found that 25 to 50% of

participants moved back and forth between periods of abstinence and heavy drinking and drug use (McKay et al., 2006).

mHealth apps may help to enhance the transfer of skills learned in therapy to real world settings, by prompting individuals to engage in health protective behavior in the environment outside of the clinic (Depp et al., 2011). Apps can include virtual coaches that provide real-time audio and visual instruction while patients practice skills (Luxton et al., 2011). mHealth apps can also help patients gradually step-down from care and provide patients with continued access to interventions after treatment has ended (Depp et al., 2011). The accessibility of mHealth apps is useful in addiction because timing is critical to preventing a relapse and providers do not typically offer ongoing support after treatment has been completed (McTavish et al., 2012). Lindhiem et al. (2015) did a meta-analysis on the effects of mobile technology on treatment outcome for psychotherapy and other behavioral interventions. They looked at 26 articles examining 25 clinical trials and found that mobile technology use was associated with superior treatment outcome across all study designs and control conditions. Patients who received mobile technology either to supplement treatment or substitute for direct contact with a clinician experienced better treatment outcome than patients who did not receive any form of mobile technology. These findings remained stable among different age groups, diagnoses, study designs, and the form of mobile technology used (Lindhiem et al., 2015).

According to Quanbeck et al. (2014), there are four systems that operate on mobile phones that assist with treating alcohol-use disorders. First, text-messaging monitoring and reminder systems are used to keep track of alcohol use and associated symptoms via text messages. They are used as a surveillance tool and not as an intervention. Second,

text-messaging interventions systems help provide targeted interventions outside of the office. One system developed a message-based intervention that, twice a day, delivered personalized supportive text messages to patients with alcohol use disorders and comorbid depression for three months (Quanbeck et al., 2014). Third, comprehensive recovery management systems consist of a variety of tools and services that utilize the capabilities characteristic of such mobile devices, including broadband Internet connection, interactive multimedia applications, text messages, global positioning system (GPS) location awareness, and social networking. Many of these resources can be tailored to the specific needs and preferences of the individual user. Lastly, game-based systems engage clients using gaming-based neuropsychological interventions in addition to treatment. They are used to improve certain cognitive functions, specifically those associated with frontal lobe-related impairment. Mobile delivery of a game-based neuropsychological intervention may help improve certain aspects of cognitive functioning among alcohol-dependent patients, but research in this area is still in developmental stages (Quanbeck et al., 2014).

### *Examples of Previously Studied mHealth Apps*

A mHealth app called A-CHESS was studied to determine its effectiveness for preventing relapse to heavy drinking for those leaving active alcohol dependence treatment (McTavish et al., 2012). It was designed to improve competence, social relatedness, and motivation. Participants used A-CHESS heavily and sustained their use over time. Among the participants, 94% used the app the first week after leaving treatment and at week 16 almost 80% continued to use the app (McTavish et al., 2012).

However, the authors noted that further investigation is needed to determine if sustained use of A-CHESS prevents relapse or improves treatment outcomes.

Rizvi et al. (2011) developed and tested the feasibility of the app *DBT Coach* among individuals with borderline personality disorder and SUDs. Among the participants, 22 individuals enrolled in DBT treatment programs. They received the app for 10 to 14 days and were instructed to use it as needed. The application first assessed the clients' ratings of emotional intensity and urges to use drugs on a 0 (*low*) to 10 (*high*) scale; then the clients were asked to identify the emotion that they were experiencing. After that, they were asked if they were willing to work on changing their emotion. If they were, they were then directed to specific coaching in the use of opposite action (OA). If they were not willing, several screens helped the users evaluate the pros and cons of changing the emotion. They were instructed to call a therapist if they still did not want to change their emotion. Finally, users were again instructed to rate their emotional intensity when they were done using the application. Participants used it on average 15 times and gave high ratings of helpfulness and usability. Results indicated that both emotion intensity and urges to use substances significantly decreased within each coaching session (Rizvi et al., 2011).

Patients have been shown to be positive about the idea of conceptualizing mobile phones as a mental health tool (Proudfoot et al., 2010). However, the acceptance is conditional upon a number of key features such as whether the program is simple and straightforward to use and whether its security and privacy could be guaranteed, especially for information sent to the mobile phone. Text message reminders are considered useful, as long as they are not intrusive. Feedback graphs are also deemed

important. Proudfoot et al. (2016) identified that individuals experiencing mental health symptoms indicated that they would be willing to use a mobile phone program more often and for longer durations of time, compared to those who were not experiencing symptoms. The individuals in the former group were also more likely to want to receive text messaging reminders to track their moods and behaviors. Both groups stated that they would like feedback on monitoring and to receive self-help suggestions from the app (Proudfoot et al., 2010).

In all, mHealth interventions have shown promise as a viable resource in the prevention, treatment, and aftercare of substance use. Effective use of mHealth apps has the potential to increase access to evidence-based care, better inform consumers of care, and more actively engage them in treatment (Kazemi et al., 2017; Price et al., 2013). The apps can also enhance care after formal treatment has concluded, hopefully cutting down on the rates of clients having to re-establish services (Price et al., 2013). Challenges exist, however, for mHealth apps directed towards treating substance use, including cost, understating which features of the apps account for the seen effects, and keeping up with technological advances (Quanbeck et al., 2014). Additionally, while mHealth apps have shown promise to improve treatment accessibility and outcomes, a number of drawbacks of mHealth apps are also of concern.

## Drawbacks of mHealth Applications

### *Limited Scientific Evidence*

While mHealth apps have the potential to be effective, the majority of the apps available to the public lack scientific evidence about their efficacy (Donker et al., 2013). The efficacy or effectiveness of mobile apps continues to be studied, but there is

insufficient empirical support for any one particular app to be considered evidence-based (Lui et al., 2017). Due to the small number of studies on any one particular app and the small sample sizes included in these studies, current findings should be interpreted with caution, until replication studies are conducted (Donker et al., 2013).

Currently, little or no quality control regulations exist to ensure health apps are user-friendly, accurate in content, evidence-based, or efficacious (Boudreaux et al., 2014). Many apps fail to incorporate evidence-based practices, health behavior theory, or clinical expertise (Shen et al., 2015). For the most part, apps are unregulated, which could lead to individuals being exposed to apps with incorrect or poor-quality information (Weaver et al., 2013). Many apps in the marketplace are of low quality and some are even unsafe (Subhi et al., 2014). A review on substance abuse apps stated that 13.3% of the participants who used the apps had increased urges to use substances while engaging with the apps (Lui et al., 2017). One app that was supposed to help individuals with bipolar disorder stated that the disorder was contagious and encouraged the use of alcohol to help with manic symptoms (Lui et al., 2017).

A study on addiction recovery apps found that only 6 of the 52 apps that were researched were developed by individuals who had clinical experience or used academic or clinical advisors in the development of their apps (Shen et al., 2015). Weaver et al. (2013) reviewed 384 alcohol-related smartphone apps. They identified that 50% of the apps were for entertainment purposes, 39% were blood alcohol concentration (BAC) apps, and 11% were health promotion and/or stop drinking-related apps. The majority of the alcohol-related apps encouraged alcohol consumption amongst users, which could be

dangerous for an individual searching for an app to assist him or her with substance abuse treatment (Weaver et al., 2013).

Gajecki et al. (2014) tested two smartphone apps targeting drinking choices on party occasions, with the goal of reducing problematic alcohol intake among university students. Both of the apps measured real time blood alcohol concentration (eBAC). The apps studied did not seem to reduce alcohol consumption among university students. One of the apps actually showed an increase in drinking among male drinkers, as they might have been using it as a drinking game in which peers competed with one another for a higher eBAC (Gajecki et al., 2014). Zhang and Ho (2016) found similar trends, noting that some individuals who used apps to track BAC used the apps in an attempt to "break their record" by drinking more alcohol than a previous time. Weaver et al. (2013) noted that apps developed to calculate BAC tend to overestimate BAC. Apps to assist with other substances other than alcohol have also been shown to be problematic. Zhang and Ho (2016) identified that most marijuana applications are for entertainment purposes. Most of the applications do not provide accurate information about the dangers associated with marijuana use (Zhang & Ho, 2016).

Since few systems have empirical evidence of effectiveness, it is important for the public to be educated on the limitations of mHealth apps, in addition to their potential benefits (Donker et al., 2013; Quanbeck et al., 2014). While individuals may view mHealth apps and self-help books as having similar components, most apps do not include information about the author and whether he or she is a credible source (Prentice & Dobson, 2014). Additionally, most self-help books include a disclaimer informing readers that the material is intended for informational purposes. It is suggested that

mHealth apps be used in conjunction with therapy, as independent interventions could be conducive to misuse and misinterpretations and could even cause harm to the users (Prentice & Dobson, 2014).

***Inadequate Protection of Confidentiality & Privacy***

Confidentiality is another concern when using mHealth apps. Data gathered from apps can be accessed by unauthorized individuals through digital theft or physical loss of a phone (Lui et al., 2017). Apps may also have inadequate data protections. They may not disclose what information is gathered and collected by developers; and personal information may be distributed to marketers and advertisers unknowingly (Lui et al., 2017). Gathering patient information on smartphone devices raises concerns about ethics and security, especially for clinicians who are responsible for maintaining their clients' confidentiality (Zhang & Ho, 2016).

Privacy policies are widely used by online service providers in order to regulate the use of personal data they collect (Steinfeld, 2016). Often times, users skip reading the privacy policy and are unaware of the way information about them is being treated and how they can control the ways in which the information is collected, stored, or shared. It was found that when the privacy policy was presented by default, more participants tended to read it quite carefully. However, when given the option to sign their agreement without reading the policy, most participants skip the policy altogether (Steinfeld, 2016).

Sunyaev et al. (2015) found that, of the most commonly used mHealth apps, only 183 (30.5%) had privacy policies. Among those policies, the average length was 1755 words with a reading grade level of 16. Two thirds of the privacy policies did not specifically address the mHealth app itself, and the policies, requiring college-level

literacy, did not make information about privacy practices transparent to users (Sunyaev et al., 2015). When O'Loughlin et al. (2018) reviewed 116 mHealth apps targeting depression to evaluate the transparency of data handling procedures, they found that 4% received a transparency score of acceptable, 28% questionable, and 68% unacceptable. Among these apps, only 49% had a privacy policy (O'Loughlin et al., 2018).

### *mHealth Half-Life*

Another issue concerning mHealth apps is that apps have a half-life, when after a certain amount of time, an app may no longer be available for public use (Torous et al., 2018). This could be problematic if a client is using the app as a primary source of support. Along these lines, creators of apps have the liberty to update apps as much or as little as they would like, and some creators completely abandon support and development of an app (Torous et al., 2018).

In summary, the vast majority of smartphone apps about substances are not evidence-based and are largely for entertainment purposes (Zhang & Ho, 2015). Some even appear to promote substance use and the apps that claim to estimate BAC are unreliable (Zhang & Ho, 2015). While there are texting-based apps that may have beneficial effects, they are insufficient as interventions for SUDs (Quanbeck et al., 2014). mHealth apps also need improvement in providing better protection of clients' confidentiality and privacy.

## Evaluating mHealth Applications

When choosing an mHealth app to assist with treatment, therapists should help clients decide if the app is appropriate (Prentice & Dobson, 2014). It is challenging to evaluate apps, as there are several broad categories of health care apps that are very

different in scope, purpose, and use (Torous et al., 2016). Some apps are simply developed to track moods and behaviors, while others assist individuals with learning and practicing different therapeutic techniques. mHealth apps vary in effectiveness depending on the individual user and should be selected on the basis of individual needs, abilities, preferences, and other personal factors (Torous et al., 2018). Torous et al. (2018) found that, when selecting apps to use in conjunction with therapy, ratings by clinicians of individual features suffer from low interrater reliability; app-store ratings, such as star-based ratings, also had low correlation with the apps' clinical utility and usability.

Due to this poor reliability, it is important for healthcare providers to standardize their identification, evaluation, and selection of health-related apps to maximize their utility, safety, and impact (Boudreaux et al., 2014). Currently, the American Psychiatric Association (APA) has developed an app evaluation framework for clinicians and patients to make informed decisions about what apps to use (Torous et al., 2018). There are a few other scales offered to help individuals make more informed decisions about mHealth apps. There is the Mobile App Rating Scale (MARS) that provides a multidimensional, reliable, and flexible app-quality rating scale for researchers, developers, and health professionals (Stoyanov et al., 2015). However, an individual must be formally trained on how to use this scale prior to use. The creators of the MARS developed the uMARS, a simpler tool that can be reliably used by end-users to assess the quality of mHealth apps (Stoyanov et al., 2016). The uMARS has excellent internal consistency for the full scale and good levels for the subscales (Stoyanov et al., 2016). Another tool is called "ASPECTS," and it helps individuals better evaluate mHealth apps by having them evaluate different components of an app (Torous et al., 2016).

There are common themes and elements across the different scales/tools. One of the main elements is privacy. To successfully facilitate self-monitoring and self-management via mobile phones, clinicians should place importance on ensuring that the programs are secure and private (Proudfoot et al., 2010). The framework developed by the APA asks users to consider safety and privacy first (Torous et al., 2018). Many apps lack basic privacy policies and exist outside the scope of federal privacy laws, which means that apps can be used to collect the personal mental health data of users, and this data can be sold, traded, marketed, and indefinitely stored by app companies (Torous et al., 2018). The MARS and uMARS also offer a number of questions on their scales to assess for confidentiality and security (Stoyanov et al., 2015). The "S" in "ASPECTS" stands for secure and asks the clinician to ensure that security features are present in the app so that patient confidentiality is not broken (Torous et al., 2016). It is recommended that apps be protected by passphrases, biometric authentication, or other security features. The app should encrypt patient data on the device itself to ensure that others cannot easily read it if the device is stolen or hacked. Clinicians can educate and counsel patients to take protective measures while using apps. It is important for apps to be transparent about how they work and how they handle privacy. Clinicians should ensure that the app is in line with professional standards, including legal and ethical considerations (Torous et al., 2016).

Efficacy is another element that is evaluated amongst the scales/tools. When efficacy is evaluated, it is important to realize that, although many apps appear useful, the actual efficacy is still developing (Torous et al., 2018). The MARS attempts to examine the information offered by apps to ensure that it is research-based and coming from a

reliable source (Stoyanov et al., 2015). It is important for clinicians to seek out apps that have clinical evidence and efficacy data, while balancing against potential unintended consequences, risks, and harm (Torous et al., 2016). Few apps have empirical research to support their use as stand-alone treatments, so a trend in the field has been for the apps to serve as adjuncts to in-person therapy (Prentice & Dobson, 2014).

Another element that is common among the scales/tools is engagement. Engagement represents the growing awareness that many patients do not stick with apps and find them difficult to use (Torous et al., 2018). It is important to evaluate whether an app is engaging to the user and is aesthetically pleasing to work with on a regular basis (Stoyanov et al., 2015). When identifying engaging apps, it is important to find ones that are customizable and have flexible features (Torous et al., 2016).

The final common element among the scales/tools is functionality (Stoyanov et al., 2015). It is important for apps to produce data that the patient and clinician can use to make informed decisions about the course of clinical care (Torous et al., 2016). Apps should have data that can be shared with the treatment team if that data is meant to help guide care and help make treatment decisions (Torous et al., 2018).

Overall, it is important for clinicians to understand the limitations of mHealth apps and be able to evaluate and recommend apps that are appropriate for treatment (Zhang & Ho, 2016). It is recommended that clinicians use validated scales to help them evaluate the information quality of existing apps (Zhang & Ho, 2016). Based on the existing scales, clinicians should examine the privacy, efficacy, engagement, and function of mHealth apps prior to recommending them to clients (Stoyanov et al., 2015; Torous et al., 2016; Torous et al., 2018).

## Current Study

The purpose of the study was to examine how clinicians are identifying, evaluating, and utilizing mHealth apps as treatment adjuncts with their clients who have a SUD. The use of mHealth apps amongst individuals with SUDs continues to grow on a regular basis, with more and more clients asking their clinicians about various apps (Torous et al., 2016). When used effectively, mHealth apps have the potential to enhance treatment interventions and help clients monitor their symptoms and increase autonomy (Prentice & Dobson, 2014). However, there are important concerns that clinicians should be aware of prior to recommending a mHealth app to their clients (Boudreaux et al., 2014). There are currently a number of scales to assist clinicians in evaluating and selecting appropriate mHealth apps (Torous et al., 2018). However, there is limited empirical evidence on how prevalent it is for therapists to use mHealth apps as treatment adjuncts with their clients and, more importantly, how they identify, evaluate, and use them to assist with treatment (Aguilera & Muench, 2012).

The main research questions of the study are:

1. What percentage of the clinicians in the study have utilized mHealth apps as treatment adjuncts with their clients who have a SUD diagnosis?
2. What factors (e.g., client inquiry, training, year of practice) significantly correlate with clinician's utilization (yes/no) of mHealth apps?
3. In regard to the clinicians who have utilized mHealth apps, how much do they educate their clients about the benefits and drawbacks of using mHealth apps, review the privacy policies of the apps, and identify empirical evidence to support the use of the apps, prior to utilizing them?

4. What factors (e.g., age, year of practice, training) predict the clinicians' behaviors described in Question 3?
5. Do mHealth apps that have elements of evidence-based treatments better assist with accomplishing treatment goals, compared to mHealth apps that do not?
6. Are clinicians more likely to recommend mHealth apps that have elements of evidence-based treatments, compared to mHealth apps that do not?
7. Are clinicians more likely to recommend mHealth apps that are customizable and engaging?
8. What types of apps have been utilized and what are the most recommended ones?
9. How do the clinicians evaluate the apps prior to utilizing them?
10. Has there been any change in the clinicians' use of mHealth apps since the COVID-19 pandemic? If yes, how?

## Chapter 2: Methods

### Participants

Participants included 110 licensed clinicians who treat patients with substance abuse disorders in the state of Kentucky. Participants were recruited by email and direct phone contact. Clinicians who work at mental health centers as well as private practicing clinicians were recruited. Clinicians who work at mental health centers were contacted via their program managers and directors, who were first contacted and informed about the study and were invited to have their centers participate. The mental health centers were identified using the 2020 National Directory of Drug and Alcohol Abuse Treatment Facilities, created by the Substance Abuse and Mental Health Services Administration. Private practicing clinicians were identified via Psychology Today's public directory and contacted by phone and email.

Seventeen participants were removed from the data set due to leaving a majority of the responses blank or not being a licensed clinician in the state of Kentucky. Therefore, these 17 participants were excluded from data analysis, resulting in a final sample size of 93, consisting of 20 males (21.5%), 72 females (77.4%), and 1 not listed (1.1%). The gender ratio of the sample was largely consistent with that of the US therapists population (24.7% male therapists and 70.4% female therapists), based on Zippia's (an employment website for job listings) 2020 demographics (Zippia, 2021). The mean age of the final sample was 43.47 years ($SD$ = 10.91), with the median age being 43 years. The majority of the sample self-identified as Caucasian ($n$ = 85; 91.4%; see Table 1) and reported that they were college graduates with a Master's degree ($n$ = 80; 86%; see Table 2).

Table 1. *Ethnicity Information of the Total Sample (N = 93)*

| Ethnicity | Number Selecting | Percent |
|---|---|---|
| American Indian or Alaska Native | 1 | 1.1% |
| Black or African American | 4 | 4.3% |
| Two or more races | 1 | 1.1% |
| White or Caucasian | 85 | 91.4% |
| Other | 2 | 2.2% |

Table 2. *Education Information of the Total Sample (N = 93)*

| Education | Number Selecting | Percent |
|---|---|---|
| Bachelor's Degree | 4 | 4.3% |
| Master's Degree | 80 | 86% |
| Doctorate | 9 | 9.7% |

The participants were sampled across Kentucky, with the majority of the sample practicing in Warren (*n* = 19; 20.4%), Jefferson (*n* = 8; 8.6%), and Fayette (*n* = 7; 7.5%) county. The mean year of practice of the final sample was 10.51 (*SD* = 8.53), with the median year of practice being 22 years. The three most frequently listed licenses were Licensed Professional Clinical Counselor (LPCC) (*n* = 24; 25.8%), Licensed Clinical Social Worker (LCSW) (*n* = 19; 20.4%), and Licensed Professional Counselor Associate (LPCA) (*n* = 10; 10.8%). The top three populations participants worked with consisted of: adult mental health outpatient/adult dual-diagnosis outpatient/adult substance abuse outpatient (*n* = 14; 15.1%); adult mental health outpatient (*n* = 8; 8.6%); and adult and

child mental health outpatient/adult and child dual-diagnosis outpatient/adult and child substance abuse outpatient ($n$ = 7; 7.5%).

**Measures**

The participants were asked to complete a 30-item questionnaire (see Appendix A). The questionnaire was developed for this study to obtain information about how clinicians who work with clients who have SUDs evaluate and utilize mHealth apps in their practice. The questionnaire consisted of eight demographic questions that covered information about participants' age, gender, ethnicity, county of practice, education level, type of licensure, years of practice, and client population served. The other 22 questions inquired about participants' evaluation and use of mHealth apps in their practice, for example, if clinicians were utilizing mHealth apps in their practice (yes/no), which mHealth apps they were recommending to clients (short-answer question), how they learned about the mHealth apps they were recommending (multiple choice), their understanding of the apps' privacy policies (Likert scale), how they evaluated mHealth apps (short-answer question), how much they educated their clients about the pros and cons as well as the protective measures of using mHealth apps (Likert scales), how useful the mHealth apps have been in assisting with the completion of treatment goals (Likert scale), how likely they would be to recommend mHealth apps to clients in the future (Likert scale), if they have attended a training that focused on the use of mHealth apps in treatment (yes/no), and if their use of mHealth apps has changed since the start of the COVID-19 pandemic (yes/no).

## Procedure

Data were collected from December 2020 through May 2021, during the COVID-19 pandemic. Prior to data collection, Institutional Review Board (IRB) approval of the study was obtained. The clinicians who indicated willingness to participate during the phone communications were sent a follow-up email. The email discussed the purpose of the research study and included a link that directed them to the Qualtrics online survey. Private practicing clinicians were provided this email directly, and the managers and directors at mental health centers were provided the email to forward to their clinicians who provide substance abuse treatment.

Participants completed the online survey via personal computers or mobile devices. The Informed Consent Document was embedded in the online survey as the first page. The Informed Consent Document provided information about the purpose and procedure of the study, the confidentiality policies, and the option to discontinue the study at any time. After the participants read the informed consent form, they chose whether or not to continue. Continued participation with the online survey implied consent.

The survey was a 30-item questionnaire. After the questionnaire was completed, participants were thanked for their participation and were presented with a debriefing statement about the purpose of the study. They also had the option to follow a link to a separate Qualtrics survey where they could enter their name and email address to be entered into a raffle for one of five $25.00 gift cards to Amazon. After data collection was concluded, five of the raffle participants were randomly selected to win the five gift cards, which were distributed via emails.

## Chapter 3: Results

### Factors That Affect Clinicians' Utilization of mHealth Apps (Yes/No)

In regard to Research Question 1, the results showed that the majority of the sample ($n$ = 66; 71%) had not utilized mHealth apps with their clients who have a SUD diagnosis. To investigate whether age and years of practice influenced clinicians' utilization of mHealth Apps (Question 2), Welch's unequal variances $t$-tests were conducted to see if there was any significant difference in age or years of practice between clinicians who had utilized mHealth apps with their clients ($n$ = 26) and those who had not ($n$ = 66). The results showed that the age of participants who had used mHealth apps with their clients ($M$ = 45.00, $SD$ = 11.28) was not significantly different from the age of those who had not ($M$= 42.82, $SD$ = 10.77), $t(45) = .84$, $p = .41$. The two groups did not significantly differ in years of practice either ($Ms$ = 10.62 vs. 10.47; $SDs$ = 8.77 vs. 8.50), $t(45) = .07$ , $p = .94$

To examine whether client inquiry (yes/no) and relevant training (yes/no) influence clinicians' utilization of mHealth Apps (Question 2), Chi-Square tests were conducted to assess the associations between client inquiry and utilization as well as between training and utilization. Clinicians who had client inquiries regarding mHealth apps were more likely to utilize mHealth apps than those who had no client inquiry, $X^2(1, N = 87) = 16.86$, $p < .001$. Clinicians who attended a training regarding mHealth apps were more likely to utilize mHealth apps than those who had no training, $X^2(1, N = 88) = 8.29$, $p < .004$.

A Chi-Square test was also conducted to test the association between utilization of mHealth apps (yes/no) and whether or not clinicians made changes regarding mHealth

apps since the COVID-19 pandemic. The results showed that clinicians who had already utilized mHealth apps were more likely to make changes to their use of mHealth apps since COVID-19 than those who had not utilized mHealth apps, $X^2(1, N = 86) = 5.74$, $p < .02$.

## Factors That Affect How Clinicians Utilize and Evaluate mHealth Apps

Next, analyses were conducted that focused on the clinicians who had utilized mHealth apps. For example, how much did they educate their clients about the pros and cons of using mHealth apps? How well did they review and understand the privacy policies of the apps that they utilized? Did age, year of practice, and training (yes/no) impact how they utilize and evaluate mHealth Apps? The results are presented below in two sections: Quantitative results (descriptive and inferential) and qualitative results.

### *Quantitative Results*

There were 27 participants who used mHealth apps with their clients who have a SUD, consisted of 3 males (11.1%), 23 females (85.2%), and 1 not listed (3.7%). The mean age of this sample was 45 years ($SD$ = 11.25), with the median age being 44 years. The majority of this sample self-identified as Caucasian ($n$ = 25; 92.6%; see Table 3) and reported that they were college graduates with a Master's degree ($n$ = 22; 81.5%; see Table 4).

Table 3. *Ethnicity Information of Clinicians Who Use mHealth Apps (N = 27)*

| Ethnicity | Number Selecting | Percent |
|---|---|---|
| American Indian or Alaska Native | 1 | 3.7% |
| White or Caucasian | 25 | 92.6% |
| Other | 1 | 3.7% |

Table 4. *Education Information of Clinicians Who Use mHealth Apps (N* = 27)

| Education | Number Selecting | Percent |
|---|---|---|
| Bachelor's Degree | 0 | 0.0% |
| Master's Degree | 22 | 81.5% |
| Doctorate | 5 | 18.5% |

The mean year of practice was 10.62 (*SD* = 8.77), with the median year of practice being 9 years. The top three licenses listed were Licensed Professional Clinical Counselor (LPCC) (*n* = 8; 29.6%), Licensed Professional Counselor Associate (LPCA) (*n* = 7; 25.9%), and Licensed Clinical Social Worker (LCSW) (*n* = 3; 11.1%). The top three populations participants worked with consisted of: adult mental health outpatient/adult dual-diagnosis outpatient/adult substance abuse outpatient (*n* = 4; 14.8%); adult mental health outpatient/adult dual-diagnosis outpatient (*n* = 3; 11.1%); and adult and child mental health outpatient/adult and child dual-diagnosis outpatient/adult and child substance abuse outpatient (*n* = 3; 11.1%). Thus, the demographics of this sample of 27 clinicians were similar to those of the full sample.

To address Question 3, descriptive statistics and Pearson Product-Moment correlations for the key variables were analyzed (see Tables 5 and 6*).* As shown by the mean values and possible ranges, the clinicians only slightly educated their clients on how to take protective measures when using mHealth apps and on the potential drawbacks of using the apps. They moderately educated their clients on the benefits of using mHealth apps. They slightly reviewed the privacy policies and somewhat comprehended the content of the privacy policies. They reported that the mHealth apps

moderately assisted with reaching treatment goals and they were moderately likely to recommend these apps in the future. Also, as shown in Table 6, significant positive correlations were observed among education about protection, education about benefits, and education about drawbacks; between review of privacy policy and comprehension of privacy policy; between comprehension of privacy policy and review of empirical evidence; and between helping meet treatment goals and future recommendation of mHealth apps.

Table 5. *Descriptive Statistics (Clinicians Who Use mHealth Apps: N* = 27)

| Variable | *M* | *SD* | Range |
|---|---|---|---|
| 1. Age | 45.55 | 11.75 | 29-73 |
| 2. Years of Practice | 10.55 | 8.89 | 1-32 |
| 3. Education about Protection | 2.45 | 1.41 | 1-5 |
| 4. Education about Benefits | 3.27 | .88 | 1-5 |
| 5. Education about Drawbacks | 2.59 | 1.30 | 1-5 |
| 6. Review of Privacy Policy | 3.59 | 1.37 | 1-6 |
| 7. Comprehension of Privacy Policy | 4.14 | 1.58 | 1-6 |
| 8. Empirical Evidence | 2.64 | 1.18 | 1-5 |
| 9. Treatment Goals | 2.68 | .99 | 1-5 |
| 10. Future Recommendation | 3.00 | 1.02 | 1-5 |

Table 6. *Pearson Product-Moment Correlations (Clinicians Who Use mHealth Apps: N = 27)*

| | Correlations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1. Age | 1 | | | | | | | | | |
| 2. Years of Practice | .54** | 1 | | | | | | | | |
| 3. Education about Protection | .13 | -.36 | 1 | | | | | | | |
| 4. Education about Benefits | .32 | -.33 | .54** | 1 | | | | | | |
| 5. Education about Drawbacks | .31 | -.35 | .87** | .64** | 1 | | | | | |
| 6. Review of Privacy Policy | -.12 | -.04 | -.36 | .02 | -.61** | 1 | | | | |
| 7. Comprehension of Privacy Policy | -.004 | -.21 | .18 | .36 | .09 | .43** | 1 | | | |
| 8. Empirical Evidence | .24 | .08 | -.10 | .01 | -.29 | .25 | *.31 | 1 | | |
| 9. Treatment Goals | .30 | .01 | -.25 | .35 | -.03 | .13 | .07 | -.07 | 1 | |
| 10. Future Recommendation | .03 | .01 | -.06 | .15 | -.04 | .02 | -.09 | -.07 | .66** | 1 |

*$p$ <.05; **$p$ <.01

To answer Question 4, regression analyses were performed to examine whether and how age, year of practice, and training (yes/no; dummy-coded) predicted each of the following outcome variables: Education about protection, education about benefits, education about drawbacks, review of privacy policy, comprehension of privacy policy, review of empirical evidence, use of mHealth app data to help meet treatment goals, and future recommendation of mHealth apps (see Table 7). The results showed that the overall model $F$ statistics were significant for these two outcome variables: Education about benefits ($F$ = 5.63, $p$ = .007) and education about drawbacks ($F$ = 5.37, $p$ = .008). Specifically, on Education about Benefits, age was a significant positive predictor, $B$ =

.06 (*SE* = .02), *p* = .003, whereas year of practice was a negative predictor, *B* = -.07 (*SE* = .02), *p* = .002. Similarly, on Education about Drawbacks, age was a significant positive predictor, *B* = .08 (*SE* = .02), *p* = .005, whereas year of practice was a negative predictor, *B* = -.10 (*SE* = .03), *p* = .002.

Table 7. *Unstandardized Regression Coefficients Showing the Effects of Age, Year of Practice, and Training on Clinicians' Behaviors Regarding mHealth Apps (Clinicians Who Use mHealth Apps: N = 27)*

| | Age | Year of Practice | Training | Adjusted $R^2$ |
|---|---|---|---|---|
| Education about Protection | .06 (.03) | -.09* (.04) | .17 (.63) | .16 |
| Education about Benefits | .06**(.02) | -.07**(.02) | .16 (.33) | .40 |
| Education about Drawbacks | .08**(.02) | -.11**(.03) | -.05 (.50) | .38 |
| Review of Privacy Policy | -.03 (.03) | .04 (.04) | -.23 (.70) | -.11 |
| Comprehension of Privacy Policy | .02 (.04) | -.03 (.05) | -.09 (.82) | -.14 |
| Review of Empirical Evidence | .03 (.03) | .01 (.04) | .51 (.59) | -.07 |
| Use of mHealth Apps to Meet Treatment Goals | .04 (.02) | -.04 (.03) | .15 (.47) | .04 |
| Future Recommendation of mHealth Apps | .03 (.03) | -.02 (.03) | .58 (.51) | -.06 |

*$p<.05$; **$p<.01$;

Questions 5 through 7 were addressed by conducting Welch's unequal variances *t*-tests. When comparing apps that have elements of evidence-based treatment (EBT) (*n* = 35) with apps that do not (*n*=5), likelihood of recommendation for them in future was not significantly different (*Ms* = 3.17 vs. 3.00, *t* (5) = .30, *p* = .78); these two types of apps

did not differ in terms of accomplishing treatment goals either, (*Ms* = 2.60 vs. 2.60, *t* (5) = .00, *p* = 1.0).

When comparing apps that are customizable (*n* = 22) with apps that are not (*n* = 19), likelihood of recommendation for them in future was not significantly different (*Ms* = 3.14 vs. 3.26, *t* (34) = -.39, *p* = .70); they are not different in terms of accomplishing treatment goals either, (*Ms* = 2.68 vs. 2.58, *t* (35) = .36, *p* = .72).

### *Qualitative Results*

Research Questions 8 to 10 pertain to the qualitative (short answer) questions that participants answered on the survey. The analyses focused on what types of apps the clinicians have utilized and what are the most recommended ones, how the clinicians evaluated the apps prior to utilizing them, and whether and how the clinicians' use of mHealth apps has changed since COVID-19.

**Recommended mHealth Apps.** There were 29 different mHealth apps that participants reported using with their clients (see Appendix E). The mHealth apps listed have various functions and some serve different purposes from one another. The functions of the mHealth apps included: Offering guided meditation, educational resources, toolkits with guided therapeutic exercises, journaling functions, mood and sobriety tracking, resources for clinicians, messaging with other individuals in recovery, and identifying Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) meeting times and locations. Three of the apps listed by participants were not listed in the Google Play Store or the iOS App Store. The two most recommended mHealth apps among clinicians were Calm (*n* = 9; 33.3%) and Headspace (*n* = 6; 22.2%). Both of these apps

are designed to help users lower stress and assist with restful sleep. Both apps offer a variety of guided meditations that can be utilized in various situations.

**Evaluation of Apps.** When asked about how they evaluated the apps prior to recommending them to patients, the majority of participants stated that they explored the features of the apps themselves (*n* = 14; 51.9%). Other ways clinicians evaluated apps prior to recommending them to patients included: Researching the apps online (*n* = 2; 7.4%); reaching out to others who have used the app in order to gain feedback (*n* = 2; 7.4%); the company they worked for provided the app (*n* = 2; 7.4%); examined reviews of the app (*n* = 1; 3.7%); and trusted the app due to being designed by a "reputable organization" (*n* = 1; 3.7%).

**Future Use of mHealth Apps.** Among the participants who use mHealth apps with their clients who have a SUD, the majority stated that they would continue to recommend apps to their clients in the future due to a variety of reasons, including that the apps offer additional support and are readily available (*n* = 9; 33%); the apps build accountability and self-efficacy among clients (*n* = 2; 7.4%); clients' learning and utilizing mindfulness skills and being able to reflect on the recovery through journaling (*n* = 4; 14.8%); clients able to use the apps as a distraction technique (*n* = 1; 3.7%); and clients being able to track and evaluate their progress with the apps (*n* = 1; 3.7%). Some participants stated that they would recommend mHealth apps depending on the specific clients they were treating (*n* = 2; 7.4%). Other participants stated that they will no longer recommend mHealth apps due to clients having poor internet connectivity (*n* = 1; 3.7%) and clients not using the apps, as they prefer more hands-on tools using tangible materials (*n* = 1; 3.7%).

**Changes Since COVID-19.** A small portion of the participants stated that their use of mHealth apps has changed since the onset of COVID-19 (*n* = 13; 14%). Some of these participants stated that they have started recommending them more to clients due to 12-step meetings not meeting in person, to clients who were not wanting to come into the office to meet face to face, or to clients who might need additional support outside of sessions. One participant stated that more clients have mentioned using mHealth apps since the onset of COVID-19. Additionally, some participants stated that they are personally using mHealth apps for themselves, along with recommending them to colleagues for additional support.

## Chapter 4: Discussion

The study sought to understand how clinicians evaluate and utilize mHealth apps as treatment adjuncts with their clients who have a SUD diagnosis. mHealth apps are constructed to play a central role in evidence-based therapies and there are currently a variety of them available to assist individuals with various mental health symptoms and disorders (Lui et al., 2017; Price et al., 2013). While mHealth interventions have shown promise as a viable resource in the prevention, treatment, and aftercare of substance use, the vast majority of them are not evidence-based (Kazemi et al., 2017; O'Loughlin et al., 2018). It is important for clinicians to understand the limitations of mHealth apps and be able to evaluate and recommend ones that are appropriate for treatment (Zhang & Ho, 2016). There is limited empirical evidence on how prevalent it is for therapists to use mHealth apps as treatment adjuncts with their clients and how they evaluate and utilize them to assist with treatment. The purpose of the study was to conduct a survey to collect both quantitative and qualitative data on the topic.

### Factors Impacting Utilization (Yes/No) of mHealth Apps

The study sample included 93 mental health clinicians located across Kentucky who work with clients with a SUD diagnosis. The majority of the participants were female (77.4%), Caucasian (91.4%), and had a master's degree (86%). The majority of the participants (71%) reported that they had not utilized mHealth apps with their clients who have a SUD diagnosis. Two factors impacted clinicians' utilization (yes/no) of mHealth apps with their clients. First, clinicians who had client inquiries about mHealth apps were more likely to recommend mHealth apps compared to those who received no inquiries. Clinicians who attended a training on mHealth apps were also more likely to

recommend mHealth apps compared to clinicians who had not attended a training. However, age or number of years of practice was not significantly different between those who use mHealth apps and those who do not.

**Educating Clients about Utilizing mHealth Apps**

Clinicians who utilize mHealth apps, on average, only slightly educated their clients regarding the drawbacks about mHealth apps and how to take protective measures when using them. They also only reported a moderate amount of discussion regarding the benefits of using mHealth apps with their clients. This might be due to most U.S. adults (over 50%) owning a smartphone and that use of mHealth apps have been recently growing (Berry & Lai, 2014; Kazemi et al., 2017). Since owning smartphones and using apps are becoming common practice, clinicians may not feel the need to educate their clients about the drawbacks of using apps and how to maintain protective measures while using them. Receiving limited education regarding drawbacks and protection could leave a client vulnerable to having sensitive information unknowingly shared with third-parties.

It was found that clinician age was a significant positive predictor for clinicians educating their clients about the benefits and drawbacks of using mHealth apps. On the other hand, years of practice was a significant negative predictor for clinicians educating their clients about the benefits and drawbacks of using mHealth apps. This was an interesting finding, as age and years of practice would be assumed to show similar impacts on factors given their positive correlation. It could be that, despite being positively correlated, age and years of practice are distinct variables. For instance, one participant was 59 years old but has only practiced for four years and another participant was 73 years old but has only practiced for six years. Older individuals may be more

conscientious or patient in general than younger individuals, which could contribute to the positive correlation between age and the extent of educating clients about mHealth apps. On the other hand, as years of practice increase, clinicians may be more susceptible to fatigue or burnout (Dzau et al., 2018), which could be reflected in behaviors such as insufficiently educating clients on important information.

**Evaluation and Future Recommendations of mHealth Apps**

App features such as having elements of EBT or not and being customizable or not made no significant difference in the likelihood of future recommendation. These findings may be due to the lack of training received regarding utilizing mHealth apps. Only eight (30.8%) participants who utilize apps with clients reported attending a training specifically discussing the use of mHealth apps. If clinicians have not been properly trained, they may not understand the importance of evaluating mHealth apps across broad categories prior to recommendation.

Among the 29 different apps that were reported, the two most recommended apps were guided meditation apps, designed to help users lower stress and assist with restful sleep. It is likely that these apps are recommended because stress and poor sleep relate to common factors that impact clients' relapsing, including increased craving and symptoms of anxiety (McKay et al., 2006).

It was also found that three of the apps listed by participants were not listed in the Google Play Store or the iOS App Store. This may be attributed to mHealth apps' half-life: After a certain amount of time, an app may no longer be available for public use (Torous et al., 2018). This may be a factor that impacts specific mHealth apps gaining proper scientific evidence. There are currently very few mHealth apps with proper

empirical evidence and the ones that have been evaluated are often not publicly available (Schueller & Torous, 2020).

When examining how clinicians evaluate mHealth apps prior to utilizing them, it was found that the majority of participants (51.9%) explored the features of the apps themselves. Unfortunately, ratings by clinicians of individual features suffer from low interrater reliability (Torous et al., 2018). It is highly recommended that clinicians use a standardized scale to identify, evaluate, and select appropriate mHealth apps, to maximize their utility, safety, and impact (Boudreaux et al., 2014). None of the participants mentioned using a standardized scale when discussing techniques for examining mHealth apps prior to recommending them to clients.

Finally, a small portion of participants stated that their use of mHealth apps has changed since the onset of COVID-19. It was reported that these changes occurred to provide additional support during a time when clients had limited in-person resources available to them. These reasons fit with the research regarding one of the main purposes of mHealth apps, which is for them to assist with barriers that may arise preventing clients from receiving face-to-face treatment (Berry & Lai, 2014).

**Clinical Implications and Future Research Directions**

In light of the study findings, it may be worthwhile to develop improved training programs on mHealth apps for clinicians. If clinicians are better trained on the benefits and drawbacks of mHealth apps and on how to evaluate the apps with standardized scales, they may be able to more effectively work with clients on selecting and using mHealth apps to improve safety and treatment outcomes. Due to a large number of mHealth apps not having privacy policies and poor transparency among the ones that do

have privacy policies, it is important for clinicians to properly educate their clients on how to take protective measures. The current study showed that the degree to which clinicians reviewed privacy policies had a positive correlation with the extent to which clinicians understood the policies, which in turn had a positive correlation with how much empirical evidence was identified for the apps. It is recommended that clinicians create informed consent documents specifically regarding the use of mHealth apps, to review with clients prior to utilization.

In terms of future research directions, it will be useful to examine clinicians' use of mHealth apps with a larger and more diverse sample of clinicians from a larger region. The current study has a small sample size ($n = 93$) and consists of participants only from Kentucky. It would also be useful to further examine the topic from the clients' perspectives; for example, how clients are identifying, evaluating, and utilizing mHealth apps, their perceptions regarding mHealth apps as an adjunct to treatment, and how much of an impact mHealth apps have on their treatment. Researchers could also examine what specific features of the apps clients believe are the most important, which could be informative as clinicians determine which types of apps to recommend in the future. It would also be interesting to examine mHealth apps half-life as a part of long-term therapy and if clinicians and clients regularly utilize the apps throughout the process.

In conclusion, the study contributes both quantitative and qualitative data on clinicians' use of mHealth apps in interventions for SUDs. A small percentage of the participants (29%) reported that they had utilized mHealth apps with their clients. Client inquires and training regarding mHealth apps were the two factors that significantly impacted clinicians' utilization (yes/no) of mHealth apps. Clinicians who utilized

mHealth apps only slightly to moderately educated clients regarding benefits, drawbacks, and protective measures of using mHealth apps, maybe due to a lack of awareness of the importance of such education. Clinicians evaluated mHealth apps primarily by exploring the features of the apps themselves, highlighting the need to train clinicians on how to use validated standardized scales to examine the privacy, efficacy, engagement, and function of mHealth apps.

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## Appendix A: mHealth Application Questionnaire

1. What is your age?

| |
|---|
| |

2. With which gender identity do you most identify?

| | |
|---|---|
| Female | Male |
| Transgender Female | Transgender Male |
| Gender Variant/Non-Conforming | Not Listed |
| Prefer Not to Answer | |

3. With what racial or ethnic background do you identify?

| | |
|---|---|
| American Indian or Alaska Native | Two or more races |
| Asian | White or Caucasian |
| Black or African American | Other |
| Hispanic or Latino | Decline to answer |
| Native Hawaiian or Other Pacific Islander | |

4. In what state do you practice?

| |
|---|
| |

5. What is your highest level of education?

| |
|---|
| |

6. What type(s) of professional license(s) do you currently hold?

| |
|---|
| |
| |
| |

7. How many years have you been a practicing clinician?

| |
|---|
| |

8. What client population do you primarily work with? (Check all that apply)

| | |
|---|---|
| Adult Mental Health Outpatient | Adult Substance Abuse Outpatient |
| Adult Dual-Diagnosis Outpatient | Adult Mental Health Residential |
| Adult Substance Abuse Residential | Child/Adolescence Mental Health Outpatient |
| Child/Adolescence Substance Abuse Outpatient | Child/Adolescence Dual-Diagnosis Outpatient |
| Child/Adolescence Mental Health Residential | Child/Adolescence Substance Abuse Residential |
| Other | |

**For the purposes of this study, a mobile health (mHealth) phone application (app) refers to an application an individual can download to his or her mobile device that is designed to assist with various health care needs. Please DO NOT include text messaging (e.g. SMS), email (e.g. Outlook), or telecommunication specific (e.g. Zoom) apps when completing this survey.**

9. Have you ever recommended a mHealth app to a client with a substance use disorder for treatment purposes?

| | |
|---|---|
| Yes | No |

If no, skip to question 27.

10. Please list the names of the mHealth apps you have recommended to clients with substance use disorders.

| | |
|---|---|
| App 1 | |
| App 2 | |
| App 3 | |

11. How did you learn about the mHealth apps that you have recommended to clients with substance use disorders? (Check all that apply)

| | |
|---|---|
| From a colleague | At a conference/training/research article |
| From a client | From an advertisement |
| Came across it while on the internet or app store | Other |

12. In a few sentences, describe how you have evaluated mHealth apps prior to recommending them to clients with substance use disorders.

| |
|---|
| |

13. Did the apps have a privacy policy that were easily accessible?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

14. How much did you review the apps privacy policy prior to recommending the apps to a client?

| App 1 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - Not at all | 3 - Slightly | 4 - Moderately | 5 - Quite a bit | 6 - Extremely |

| App 2 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - Not at all | 3 - Slightly | 4 - Moderately | 5 - Quite a bit | 6 - Extremely |

| App 3 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - Not at all | 3 - Slightly | 4 - Moderately | 5 - Quite a bit | 6 - Extremely |

15. How confident were you that you adequately understood the terms listed in the privacy policy?

| App 1 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - I did not read the policy. | 3 - I did not understand the policy at all. | 4 - I somewhat understood the policy. | 5 - I mostly understood the policy. | 6 - I completely understood the policy. |

| App 2 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - I did not read the policy. | 3 - I did not understand the policy at all. | 4 - I somewhat understood the policy. | 5 - I mostly understood the policy. | 6 - I completely understood the policy. |

| App 3 | | | | | |
|---|---|---|---|---|---|
| 1 - There was no policy | 2 - I did not read the policy. | 3 - I did not understand the policy at all. | 4 - I somewhat understood the policy. | 5 - I mostly understood the policy. | 6 - I completely understood the policy. |

16. How much did you educate clients on how to take protective measures when using mHealth apps?

| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extensively |
|---|---|---|---|---|

17. How much did you educate clients about the benefits of using mHealth apps prior to recommending them?

| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extensively |
|---|---|---|---|---|

18. How much did you educate clients about the potential drawbacks of using mHealth apps prior to recommending them?

| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extensively |
|---|---|---|---|---|

19. How much empirical evidence did you identify to support the use of the specific apps you recommended?

| App 1 | | | | |
|---|---|---|---|---|
| 1 - None | 2 - A small amount | 3 - A moderate amount | 4 - A fair amount | 5 - An extensive amount |

| App 2 | | | | |
|---|---|---|---|---|
| 1 - None | 2 - A small amount | 3 - A moderate amount | 4 - A fair amount | 5 - An extensive amount |

| App 3 | | | | |
|---|---|---|---|---|
| 1 - None | 2 - A small amount | 3 - A moderate amount | 4 - A fair amount | 5 - An extensive amount |

20. Did the apps have elements of evidence based treatments?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

21. Were the apps customizable?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

22. Did you use the app prior to recommending them to clients to identify how engaging the apps were?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

23. Did you utilize data collected in the app during treatment sessions?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

24. Was data collected in the app able to be shared with the treatment team?

| App 1 | |
|---|---|
| Yes | No |

| App 2 | |
|---|---|
| Yes | No |

| App 3 | |
|---|---|
| Yes | No |

25. How well did the apps assist with accomplishing treatment goals?

| App 1 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

| App 2 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

| App 3 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

26. How likely are you to recommend these mHealth apps to clients with substance use disorders in the future?

| App 1 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

| App 2 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

| App 3 | | | | |
|---|---|---|---|---|
| 1 - Not at all | 2 - Slightly | 3 - Moderately | 4 - Quite a bit | 5 - Extremely |

27. Please briefly explain why you would or would not recommend mHealth apps to clients with substance use disorders in the future.

| |
|---|
| |

28. Has a client with a substance use disorder ever asked you about a mHealth app that they have learned about or have been using?

| Yes | No |
|---|---|

29. Have you ever attended a training that specifically discussed the use of mHealth apps in treatment?

| Yes | No |
|---|---|

30. Has your use of mHealth apps changed since the COVID-19 pandemic?

| Yes | No |
|---|---|

If so, please explain how it has changed.

| |
|---|
| |

## Appendix B: IRB Approval

*INSTITUTIONAL REVIEW BOARD*
*OFFICE OF RESEARCH INTEGRITY*

| | |
|---|---|
| DATE: | October 7, 2020 |
| TO: | James Bender, M.A. |
| FROM: | Western Kentucky University (WKU) IRB |
| PROJECT TITLE: | [1658155-1] Clinicians' Use of mHealth Applications in Interventions for Substance Use Disorders |
| REFERENCE #: | IRB 21-055 |
| SUBMISSION TYPE: | New Project |
| ACTION: | APPROVED |
| APPROVAL DATE: | October 7, 2020 |
| EXPIRATION DATE: | May 31, 2021 |
| REVIEW TYPE: | Expedited Review |

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an *implied* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a MINIMAL RISK project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of May 31, 2021.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Robin Pyles at (270) 745-3360 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

# Appendix C: Informed Consent


**IMPLIED CONSENT DOCUMENT**

**Project Title:** Clinicians' Use of mHealth Applications in Interventions for Substance Use Disorders
**Investigator:** James D. Bender, Department of Psychology; james.bender076@topper.wku.edu

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your agreement to participate in this project.

**You must be 18 years old or older to participate in this research study.**

A basic explanation of the project is written below. Please read this explanation and email the researcher any questions you may have. If you then decide to participate in the project, please continue to the survey. You should keep a copy of this form for your records.

**Nature and Purpose of the Project:** This study looks to examine how therapists located in Kentucky are using mHealth phone applications in their practice to treat substance use disorders.

**Explanation of Procedures:** Participation in this study will involve answering a few demographic items and completing a questionnaire with a total of 30 items. We anticipate that your involvement will require approximately 10-20 minutes. Participants must be at least 18 years of age to participate, speak English and be a practicing clinician working with clients that have substance use disorders. Participants must be practicing in Kentucky.

**Discomfort and Risks:** We anticipate no known risks or costs as a result of participating in the study.

**Benefits:** Participants who complete the survey will have the option to be entered in a raffle for the potential to win one of five $25.00 gift cards to Amazon. Further, we believe that our results will add to scientific knowledge about clinicians use of mHealth applications in the treatment with individuals with substance use disorders.

**Confidentiality:** Your identity will not be collected and thus will not be tied to the data. Only the researchers involved in this study and those responsible for research oversight will have access to the information you provide. The results of the study will be reported as aggregate data that contain no identifying information. Records will be viewed, stored, and maintained in private, secure files only accessible by the P.I. and advising faculty for three years following the study, after which time they will be destroyed.

**Refusal/Withdrawal:** Participation in this study is completely voluntary. You are free to decline to participate, to end participation at any time for any reason, or to refuse to answer any individual question without penalty.

*You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.*

**Contact:**
If you have any questions about this study, you may contact the primary investigator, James Bender via email at james.bender076@topper.wku.edu or his dissertation supervisor, Dr. Qin Zhao at qin.zhao@wku.edu.

You may print a copy of this electronic consent form for your records. Your continued participation indicates that
- ☐ You have read the above information
- ☐ You voluntarily agree to participate
- ☐ You are 18 years of age or older

***Your continued cooperation with the following research implies your consent.***

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Robin Pyles, Human Protections Administrator
TELEPHONE: (270) 745-3360

WKU IRB# 21-055
Approved: 12/06/2020
End Date: 5/31/2021
EXPEDITED
Original: 10/07/2020

## Appendix D: Debriefing Statement

Thank you for your participation in this experiment. The goal of this study was to examine how therapists located in the United States of America are using mHealth phone applications (apps) in their practice to treat substance use disorders. It seeks to identify how many therapists are using mHealth apps to assist with treatment interventions, what types of apps are frequently being recommended, how they are evaluating apps prior to recommending them to clients, and whether and how therapists inform their clients of the pros and cons of the recommended apps. Your participation is greatly appreciated by the researchers involved.

If you would like to be entered into the raffle to win a $25.00 Amazon gift card, please follow the link below and enter your name and email address.

https://wku.co1.qualtrics.com/jfe/form/SV_cSnwfk1cox9Pgbp

## Appendix E: mHealth Apps Listed by Participants

3 Good Things
7 Cups of Tea
12 Steps App
24 hours a day
AA Big Book
ACT Coach
Calm
Day to Day
Daylio
Gottman Card Decks
Grateful Journal
Headspace
Insight Timer
In The Rooms
Meta
Mindfulness
Mindfulness Coach
Narcotics Anonymous
National Suicide Hotline
Overcoming Addiction
Pear reSET-O
Pursue Care
Rehabs Finder
SAMHSA
Sanvello
Sober Grid
Teledoc
Thought Diary
Vsee

Note: mHealth apps listed in this study should not be considered an endorsement by the author. The author cannot guarantee the efficacy of the apps presented above.